Geophysical Research Abstracts
Vol. 14, EGU2012-8071, 2012
EGU General Assembly 2012
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Use of mobile gammaspectrometry for estimation of texture at regional scale

C. Dierke, U. Werban, and P. Dietrich
Helmholtz Centre for Environmental Research - UFZ, MET, Germany (claudia.dierke@ufz.de)

In the last years gamma-ray measurements from air and ground were increasingly used for spatial mapping of physical soil parameters. Many applications of gamma-ray measurements for soil characterisation and in digital soil mapping (DSM) are known from Australia or single once from Northern America. During the last years there are attempts to use that method in Europe as well.

The measured isotope concentration of the gamma emitter ^{40}K, ^{238}U and ^{232}Th in soils depends on different soil parameters, which are the result of composition and properties of parent rock and processes during soil geneses under different climatic conditions. Grain size distribution, type of clay minerals and organic matter are soil parameters which influence directly the gamma-ray concentration. From former studies we know, that there are site specific relationships at the field scale between gamma-ray measurements and soil properties. One of the target soil properties in DSM is for e.g. the spatial distribution of texture at the landscape scale. Thus there is a need of more regional understanding of gamma-ray concentration and soil properties with regard to the complex geology of Europe.

We did systematic measurements at different field sites across Europe to investigate the relationship between the concentrations of gamma radiant and grain size. The areas are characterised by different pedogenesis and varying clay content. For the measurement we used a mobile 4l Na(I) detector with GPS connection, which is mounted on a sledge and can be towed across the agricultural used plane. Additionally we selected points for soil sampling and analysis of soil texture.

For the interpretation we used the single nuclide concentration as well as the ratios. The results show site specific relationships dependent from source material. At soils developed from alluvial sediments the K/Th ratio is an indicator for clay content at regional scale. At soils developed from loess sediments Th can be used do discriminate between fine (clay + silt) and coarse (sand) fraction. This knowledge will led to a more conceptual understanding of gamma-ray measurements at regional scale.

These activities are done within the iSOIL project. iSOIL- Interactions between soil related sciences – Linking geophysics, soil science and digital soil mapping is a Collaborative Project (Grant Agreement number 211386) co-funded by the Research DG of the European Commission within the RTD activities of the FP7 Thematic Priority Environment; iSOIL is one member of the SOIL TECHNOLOGY CLUSTER of Research Projects funded by the EC.